

Remarks

The Office Action dated August 22, 2003 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1, 2, 4-6, 8-10, 12, and 13 are pending in this application. Claims 1, 2, 4-6, 8-10, 12, and 13 stand rejected.

In accordance with 37 C.F.R. 1.136(a), a two month extension of time is submitted herewith to extend the due date of the response to the Office Action dated August 22, 2003, for the above-identified patent application from November 22, 2003, through and including January 22, 2004. In accordance with 37 C.F.R. 1.17(a), authorization to charge a deposit account in the amount of \$420.00 to cover this extension of time request also is submitted herewith.

Claims 1, 5, 6, 9, 10, and 13 have been amended to more clearly define the scope of the pending claims and to clearly differentiate over the cited art. Particularly, the term fuel bundle has been changed to fuel assembly in the amended claims. Applicants submit that the term "fuel bundle" as used in the present application means "fuel assembly". Specifically, the application at page 8, lines 7-11 describes: "Conventional size fuel assemblies 36 and large control rods 76 are arranged in a F-lattice configuration 94 to facilitate minimizing the number of control rod drives and control rods. F-lattice configuration 94 has large control rods 76 in staggered rows 96 with sixteen conventional fuel bundles 36 surrounding each large control rod 76." Applicants submit that the terms have been used interchangeably throughout the specification. Applicants further submit that none of the cited art describes or suggests that control rods are arranged in a plurality of staggered rows with only four separate independent fuel assemblies in each receiving channel and two sides of each of the four independent fuel assemblies adjacent a control rod blade. The

art cited teach a single fuel assembly in each receiving channel of the control rods. The cited art teach that the single fuel assembly is formed from four interdependent sub-assemblies. Each sub-assembly described in the cited art cannot be independently removed or lowered into a reactor core because the sub-assemblies are connected together within an outer housing to form a single independent fuel assembly. The Advisory Action dated 5/22/03 admits that Hirawa teaches "a conventional fuel assembly having four mini-bundles therein", and that Hirawa teaches "only one fuel assembly per quadrant in relation to the control rod".

Applicants disagree with the suggestion of the current Office Action that "the broad nature of the claims allows for the mini-bundle assemblies of Hiraiwa or Kusuno to read on applicant's invention". This suggestion ignores some of the recitations of the pending claims. Particularly the claims of the present invention recite separate independent fuel assemblies that include a handle to facilitate lowering the fuel assembly into the core. The mini-bundles of Hiraiwa, Kusuno, and Taleyarkhan are not separate and independent, but rather they are interdependent and part of a single fuel assembly. Further, one skilled in the art would understand that the mini-bundles of the cited art cannot be separately lowered into the core because they are part of a single fuel assembly. Applicants submit that none of the cited art teach or suggest the invention recited in the pending claims. Therefore, the pending claims are patentable over the cited art.

The rejection of Claims 1, 2, 6, and 10 under 35 U.S.C. § 103(a) as being unpatentable over Hiraiwa (JP 06-138275) in view of Taleyarkhan (US 4,649,021) is respectfully traversed.

Claim 1 of the present application recites a core for a nuclear reactor that includes a plurality of separate independent fuel assemblies and a plurality of large control rods. Each

independent fuel assembly includes a handle to facilitate lowering the fuel bundle into the core. Each control rod includes four control rod blades extending radially from a central portion and arranged at right angles to each other. The blades define four fuel assembly receiving channels, and the control rods are arranged in a plurality of staggered rows with only four independent fuel assemblies in each receiving channel and two sides of each of the four independent fuel assemblies adjacent a control rod blade.

Applicants submit that Hiraiwa does not describe nor suggest a core for a nuclear reactor as recited in Claim 1. Particularly, Hiraiwa does not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four separate independent fuel assemblies in each receiving channel and two sides of each of the four independent fuel assemblies adjacent a control rod blade.

As best understood, it appears that Hiraiwa teaches control rods having four control rod blades extending from a central portion with a single fuel assembly in each receiving channel. Applicants submit that Hirawa clearly shows in Figure 4 a single fuel assembly 30A in the receiving channel defined by the control rod blades. This single fuel assembly 30A is formed from four sub-assemblies 41. There is no indication that sub-assemblies 41 are separate and independent. Rather, Applicants submit that Figure 4 clearly shows that sub-assemblies 41 are interdependent and are part of a single fuel assembly 30A. One can clearly see that sub-assemblies 41 are housed inside an outer fuel assembly housing 40. Further, the Advisory Action dated 5/22/03 admits that Hirawa teaches "only one fuel assembly per quadrant in relation to the control rod".

Taleyarkhan describes a single fuel assembly that is formed from four separate sub-assemblies housed inside an elongated outer tubular flow channel 12 formed from interconnected vertical walls 20. Each fuel assembly includes a plurality of boxes defining fuel sub-assemblies. The boxes are connected at one end to a common bottom unit and at the other end to a common top unit to form a single fuel assembly. Each box contains a plurality of fuel rods. Also, Taleyarkhan shows a single handle to facilitate lowering the entire fuel assembly into a core. Taleyarkhan does not describe nor suggest, nor does Hirawa describe nor suggest that each sub-assembly includes a handle to facilitate lowering the sub-assembly into a core. Applicants submit that the sub-assemblies shown in Figure 4 of Hirawa like the sub-assemblies described and shown by Taleyarkhan are interdependent and are connected together within an outer housing to form one single fuel assembly. Each sub-assembly of Hirawa or Taleyarkhan cannot be independently removed or lowered into a reactor core because the sub-assemblies are connected together within an outer housing to form a single independent fuel assembly. The sub-assemblies of Hirawa or Taleyarkhan are interdependent rather than separate and independent.

Further, because the sub-assemblies of Hirawa or Taleyarkhan are interdependent rather than independent it would not be obvious to modify the sub-assemblies of Hirawa or Taleyarkhan to include individual handles as suggested at page 4 of the Office Action dated 3/14/03. Applicants submit that there is no motivation to modify these sub-assemblies. Particularly, individual handles on the sub-assemblies would serve no useful purpose because the individual sub assemblies cannot be separately removed from the single fuel assembly. Applicants submit that the only motivation to modify the sub-assemblies of Hirawa or

Taleyarkhan to include individual handles comes from Applicants' application and thus the rejection is improper. Accordingly, Applicants submit that Claim 1 is patentable over Hiraiwa and Taleyarkhan, alone or in combination.

Claim 2 depends from independent Claim 1. When the recitations of dependent Claim 2 are considered in combination with the recitations of Claim 1, Applicants respectfully submit that Claim 2 likewise is patentable over Hiraiwa and Taleyarkhan, alone or in combination.

Claim 6 of the present application recites a core for a nuclear reactor that includes a plurality of fuel cells. Each fuel cell including a large control rod comprising four control rod blades extending radially from a central portion and arranged at right angles to each other. The blades defining four quadrants of the fuel cell, each quadrant consisting of only four separate independent fuel assemblies. Each separate independent fuel assembly includes a handle to facilitate lowering the fuel assembly into the core. The plurality of fuel cells are arranged so that the control rods are in a staggered row pattern where each side of each quadrant of a fuel cell is adjacent to a control rod blade.

Hiraiwa and Taleyarkhan, alone or in combination, do not describe nor suggest a core for a nuclear reactor as recited in Claim 6. Particularly, for the reasons explained above, Hiraiwa and Taleyarkhan, alone or in combination, do not describe nor suggest a fuel cell that includes a large control rod comprising four control rod blades extending radially from a central portion and arranged at right angles to each other with the blades defining four quadrants of the fuel cell, and each quadrant consisting of only four separate independent fuel assemblies. Accordingly, Applicants submit that Claim 6 is patentable over Hiraiwa and Taleyarkhan, alone or in combination.

Further, Claim 10 of the present application recites a nuclear reactor core configuration where the core includes a plurality of separate independent fuel assemblies and a plurality of large control rods. Each separate independent fuel assembly includes a handle to facilitate lowering the fuel bundle into the core. Each control rod includes four control rod blades extending radially from a central portion and arranged at right angles to each other with the blades defining four fuel assembly receiving channels. The configuration comprising the plurality of large control rods arranged in a staggered row pattern, and the fuel assemblies arranged with only four separate independent fuel assemblies in each receiving channel and two sides of each of the four independent fuel bundles adjacent a control rod blade.

Applicants submit that Hiraiwa and Taleyarkhan, alone or in combination, do not describe nor suggest a core for a nuclear reactor as recited in Claim 10. Particularly, for the reasons explained above, Hiraiwa and Taleyarkhan, alone or in combination, do not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four separate independent fuel assemblies in each receiving channel and two sides of each of the four independent fuel assembly adjacent a control rod blade. Accordingly, Applicants submit that Claim 10 is patentable over Hiraiwa and Taleyarkhan, alone or in combination.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 1, 2, 6, and 10 be withdrawn.

The rejection of Claims 1, 2, 6, and 10 under 35 U.S.C. § 103(a) as being unpatentable over Kusuno. (JP 04-296693) in view of Taleyarkhan (US 4,649,021) is respectfully traversed.

Applicants submit that Kusuno does not describe nor suggest a core for a nuclear reactor as recited in Claim 1, a core for a nuclear reactor as recited in Claim 6, nor a nuclear reactor core

configuration as recited in Claim 10. Particularly, Kusuno does not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four separate independent fuel assemblies in each receiving channel and two sides of each of the four independent fuel assemblies adjacent a control rod blade.

As best understood, it appears that Kusuno teaches control rods having four control rod blades extending from a central portion with a single fuel assembly in each receiving channel. Applicants submit that Kusuno clearly shows in Figure 13 a single fuel assembly 1 in the receiving channel defined by the control rod blades (shown in Figure 1), and also shows four sub-assemblies 5 that form the single fuel assembly 1. Applicants submit that Figure 13 clearly shows an outer fuel bundle housing 4 defining the single fuel assembly 1 and surrounding the sub-assemblies 5. The supplied abstract of Kusuno states that "Fuel assemblies 1 comprising the sub fuel area divided into pieces and reinforced by structural material are regularly arranged so that water passages 6 filled with reactor water of a # shape may be formed". Applicants submit that this statement shows that Kusuno teaches a single fuel assembly formed by sub-assemblies within an outer housing. There is no indication that sub-assemblies 5 are separate and independent. Rather, Applicants submit that Figure 13 clearly shows that sub-assemblies 5 are interdependent and are part of a single fuel assembly 1. One can clearly see that sub-assemblies 5 are housed inside an outer fuel bundle housing 4.

Applicants submit that the fuel assembly 1 shown in Figure 13 of Kusuno is similar to the fuel assembly described by Taleyarkhan (US 4,649,021). Taleyarkhan describes a single fuel assembly that is formed from four separate sub-assemblies. Each fuel assembly includes a plurality of boxes defining fuel subassemblies. The boxes are connected at one end to a common

bottom unit and at the other end to a common top unit to form a single fuel assembly. Each box contains a plurality of fuel rods. Also, Taleyarkhan shows a single handle to facilitate lowering the fuel assembly into a core. Taleyarkhan does not describe nor suggest, nor does Kusuno describe nor suggest that each sub-assembly includes a handle to facilitate lowering the sub-assembly into a core. Applicants submit that the sub-assemblies shown in Figure 13 of Kusuno like the sub-assemblies described and shown by Taleyarkhan are interdependent and are connected together within an outer housing to form one single fuel assembly. Each sub-assembly of Kusuno or Taleyarkhan cannot be independently removed or lowered into a reactor core because the sub-assemblies are interdependent and are connected together within an outer housing to form a single independent fuel assembly.

Further, because the sub-assemblies of Kusuno or Taleyarkhan are interdependent rather than independent it would not be obvious to modify the sub-assemblies of Kusuno or Taleyarkhan to include individual handles as suggested at page 5 of the Office Action dated 3/14/03. Applicants submit that individual handles on the sub-assemblies would serve no useful purpose because the individual sub assemblies cannot be separately removed from the single fuel assembly. Accordingly, Applicants submit that Claims 1, 6, and 10 are patentable over Kusuno and Taleyarkhan, alone or in combination.

Claim 2 depends from independent Claim 1. When the recitations of dependent Claim 2 are considered in combination with the recitations of Claim 1, Applicants respectfully submit that Claim 2 likewise is patentable over Kusuno and Taleyarkhan, alone or in combination.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 1, 2, 6, and 10 be withdrawn.

The rejection of Claims 4, 5, 8, 9, 12, and 13 under 35 U.S.C. § 103(a) as being unpatentable over Hiraiwa (JP 06-138275) or Kusuno. (JP 04-296693) in view of Taleyarkhan (US 4,649,021) and further in view of Figures 1-3 is respectfully traversed.

As explained above independent Claims 1, 6, and 10 are patentable over Hiraiwa, Kusuno and Taleyarkhan, alone or in combination.

Applicants submit that Hiraiwa or Kusuno in combination with Taleyarkhan and in combination with Figures 1-3 do not teach or suggest a core for a nuclear reactor as recited in Claim 1, a core for a nuclear reactor as recited in Claim 6, or a nuclear reactor core configuration as recited in Claim 10 because neither Hiraiwa, Kusuno, Taleyarkhan, nor Figures 1-3 describe or suggest a core with the control rods arranged in a plurality of staggered rows with only four separate independent fuel assemblies in each receiving channel and two sides of each of the four fuel assemblies adjacent a control rod blade. Accordingly, Claims 1, 6, and 10 are submitted to be patentable over Hiraiwa or Kusuno in combination with Taleyarkhan and in combination with Figures 1-3.

Claims 4 and 5 depend from independent Claim 1, Claims 8-9 depend from independent Claim 6, and Claims 12-13 depend from independent Claim 10. When the recitations of dependent Claims 4 and 5, and Claims 8-9, and Claims 12-13 are considered in combination with the recitations of Claims 1, 6, and 10 respectively, Applicants respectfully submit that Claims 4, 5, 8-9, and 12-13 likewise are patentable over Hiraiwa, Kusuno, Taleyarkhan, and Figures 1-3 of the present application, alone or in combination.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 4, 5, 8, 9, 12, and 13 be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Favorable action is respectfully solicited.

Respectfully submitted,



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Michael Tersillo  
Registration No. 42,180  
ARMSTRONG TEASDALE LLP  
One Metropolitan Square, Suite 2600  
St. Louis, Missouri 63102-2740  
(314) 621-5070